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TRANSLATION

INFRARED TECHNOLOGY IN COSMOS

By

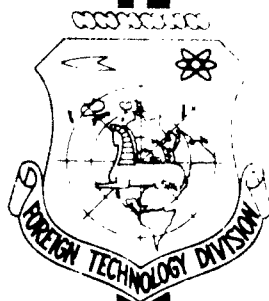
A. Sergeyev

FOREIGN TECHNOLOGY DIVISION

AIR FORCE SYSTEMS COMMAND

WRIGHT-PATTERSON AIR FORCE BASE

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UNEDITED ROUGH DRAFT TRANSLATION

INFRARED TECHNOLOGY IN COSMOS

BY: A. Sergeyev

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PREPARED BY:

TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WP-AFB, OHIO.

Infrared Technology in Cosmos

by

A. Sergeyev

I work at a plant and study in preparation for entry into the Polytechnicum. Recently I have been hearing about the use of infrared radiation in the investigation of the cosmos. Please give me some more details about it

Requested by A. Verstkin
Mechanic, grinding machine operator

Vladimir.

To speak about infrared technology- means to touch upon the most variegated aspects of science, industry and agriculture, culture, military science. It is a field connected with the utilization of infrared radiation energy. Discovered more than 150 years ago, infrared rays remained for quite a long time dormant until they finally found practical application, and only in the last decade they are being used on broad scale.

Where and how is infrared radiation used? The zone of application of infrared radiation is truly limitless. In industry with their aid is dried wood pulp, all possible lacquer ^{paint} coatings on objects, machines, details. As is reported in foreign press infrared rays in tactical application are used in the operation of night visibility instruments, heat direction finders, locators and communication and signaling installations for heads of self guiding rockets and other equipment. The possibilities of employing infrared radiation for exploring cosmic space have risen sharply. These explorations are carried out by man-made Earth satellites, automatic interplanetary stations and by astronomical means as well.

All radiations investigated in nature have an identical electromagnetic wave characteristic. Infrared rays are invisible. Their wavelength varies from 0.76 to

several hundred microns . They are subject to all laws of geometrical and physical optics: they reflect, refract, propagate rectilinearly. In phenomena of interference, diffraction and polarization do their wave properties develop. Optics, intended for visible light, may be found to be unsuitable for infrared rays, particularly with a wavelength of more than 3 microns. That is why elements of optical systems for them are made of such materials, as molten quartz, silicon, germanium, sapphire, pericase and others, having the necessary qualities.

The process of origination of infrared radiation is connected with oscillatory and rotary movements of molecules of the substance. It may stop only at a temperature of absolute zero (minus 273.16 degrees). Consequently, any body having a temperature above absolute zero, appears to be the source of these rays.

When exploring interplanetary space the infrared ray sources, are cosmic devices , artificial satellites, celestial bodies, surface and atmosphere of the Earth. And so, the Sun appears to be a colossal source of energy. About 77 percent of radiation energy are constituted by the invisible - infrared.

The surface and atmosphere of our planet are heated by the Sun and they in turn appear to be energy sources. The Earth emits into space invisible rays with a basic wavelength of 11,6 microns.

The integral part of the apparatus utilizing infrared radiation are receivers or indicators. They transform radiant energy into thermal, electrical, chemical.

In the infrared apparatus, used at present time for studying the cosmos, is employed basically the the passive mode of operation. In this case the apparatus does not send out any radiation toward the observed object, as it is done for example, in radar technology.

According to foreign press, infrared technique can be used in orientation systems and in controlling the position of man-made Earth satellites in space and also the determine the altitude of their orbit. The orientation system includes infrared

and gyroscopic feelers, logical electronic devices and control motors. Having measured the thermal contrast between the surface of the Earth and cosmic space, with the aid of the feelers is determined the local vertical of the satellite. Control motors (engines), creating a reactive force turn the satellite in order to keep it under a strictly defined angle relative to the surface of the Earth.

Infrared devices are also mounted on man-made Earth satellites sent up for meteorological investigations. Carbon dioxide and water vapors, contained in the atmosphere, exert a greater effect on temperature and climate of our planet, and at the same time act as radiation energy filters between the surface of the Earth and cosmic space.

Components constituting the atmosphere, sharply absorb infrared radiation in definite zones of the spectrum or, as it is said, in the infrared part of the spectrum exist strong absorption bands. There is also a so-called "transparency window". By measuring infrared radiation in the "transparency window" is possible to determine the temperature of underlying surface - continent or ocean. And this is very important for meteorologists and for studying sea currents as well.

It is assumed, that with the aid of infrared technology it will be possible to measure the temperature at certain altitudes, containing these or any other component parts of the atmosphere, and possible also the atmospheric pressure at the surface of the Earth. But all this requires further check up and confirmation. Measurement in the infrared part of the spectrum will enable to determine the thermal balance of the "Earth-atmosphere" system which is also extremely important for meteorological purposes.

Investigations are being carried out abroad for the purpose of creating an infrared apparatus for cosmic communication. Such devices have many properties easily distinguishing same from radio communication.

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